

SCIENTIFIC SERIALS.

THE numbers of the *Journal of Botany* for May and June appeal almost entirely to students of systematic and descriptive botany:—Mr. F. J. Hanbury continues his notes on *Hieracia* new to Britain, in the course of which he describes three species altogether new.—Mr. Geo. Massee contributes diagnoses of a number of new species of Fungi from St. Vincent, illustrated by three coloured plates.—Mr. E. G. Baker continues his Synopsis of genera and species of *Malvæ*; Rev. Moyle Rogers his essay at a key to British *Rubi*; and Mr. W. A. Clarke his first records of British flowering plants.

In the *Botanical Gazette* for May are two original papers of interest:—On the archegone and apical growth of the stem in *Tsuga canadensis* and *Pinus sylvestris*, by D. M. Mottier. On the first point the author agrees very nearly with the account by Strasburger; on the second point he is unable to say that there is a single cell at the apex of the stem, unless in the young plant, and even then not with absolute certainty.—Germination of the teleutospores of *Ravenalia cassiacola*, by B. M. Duggar.

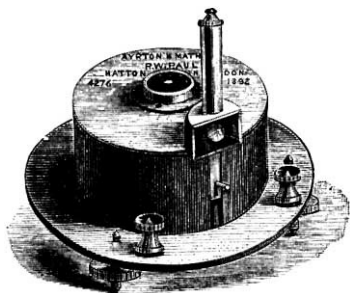
SOCIETIES AND ACADEMIES.

LONDON.

Physical Society, June 10.—Mr. Walter Baily, Vice-President, in the chair.—Dr. Gladstone read a paper on some points connected with the electromotive force of secondary batteries, by himself and Mr. W. Hibbert. The communication includes replies to certain questions raised by M. Darrieus in a paper read before the Société Internationale des Electriciens on May 4, 1892; and to the views expressed by Prof. Armstrong and Mr. Robertson in the discussion on a paper by the present authors read before the Institution of Electrical Engineers, on May 12 and 19. It also contains an account of their recent experiments on the subject. M. Darrieus agrees with Prof. Armstrong and Mr. Robertson that the large E.M.F. immediately after charge is due to persulphuric acid, and opposes the ordinary theory that the ultimate product of discharge is lead sulphate at both plates, so far as the positive plate is concerned. The authors attribute the finding of large quantities of lead oxide by M. Darrieus to difficulties in analysis, for it is not easy to imagine that oxide of lead could remain as such in presence of sulphuric acid. They have also shown that the changes of E.M.F. during charge and discharge coincide fairly well with those obtained by putting Pb and PbO₂ plates in different strengths of acid, and conclude "that the changes of E.M.F. . . . depend on the strength of the acid that is against the working surfaces of the plates." Prof. Armstrong and Mr. Robertson disagree with the authors' views, and suppose that the sulphuric acid used was contaminated with soluble peroxides; and they also believe that H₂SO₄ itself takes part in the reactions. As regards the first objection, the authors see no reason why the traces of soluble peroxide (if any) on the plates should always vary in amount with the strength of the fresh acid in which the plates were dipped. The second point they leave an open question. In reply to the criticism on the summation of the two curves obtained respectively with two lead plates and two lead peroxide plates in acids of different strengths, they point out that the resulting curve coincides both in shape and magnitude with that determined when a Pb and a PbO₂ plate were placed in different strengths of acid. Whilst admitting the possibility of the lead supports having some influence on the result, they cannot conceive that such large and uniform differences as those given in their paper can be due to accidental operations of local action. To show that the increase of E.M.F. does not depend on the presence or absence of persulphuric acid, the authors have tested the E.M.F. of a Pb and a PbO₂ plate, free from soluble oxides, in sulphuric acid of 15 per cent. strength, a porous diaphragm being between the plates. The E.M.F. was 1·945 volts. After adding 1 per cent. of persulphate of potassium to the liquid surrounding the PbO₂ plate, the E.M.F. was unaltered; whilst putting the Pb plate in the same liquid only reduced the E.M.F. to 1·934. Experiments had also been made on cells with phosphoric acid of different strengths, instead of sulphuric acid. Changing the density from 1·05 to 1·5, raised the E.M.F. 0·176 volt, whilst calculations from Lord Kelvin's law gave 0·171 volt. In this case they consider that no acid analogous to persulphuric acid could be

present. They also find that the effects of charging and repose on the E.M.F. of phosphoric acid cells are quite analogous to those obtained with sulphuric acid. The researches are being extended chiefly on the thermochemical side. Prof. Ayrton thought there was no question that the strength of acid had much to do with the changes of E.M.F. The point at issue, he considered, was whether the changes were direct effects of the strength of acid, or due to secondary actions brought about by alterations in strength. Mr. E. W. Smith said Mr. Robertson and himself were repeating the author's experiments with two PbO₂ plates without any grid. They had obtained results analogous to those mentioned in the paper, but the true explanation of the effects was still to seek. Mr. W. Hibbert contended that the soluble oxides referred to by Prof. Armstrong and Mr. Robertson were not present in their experiments. They had also proved that changes in acid strength altered the E.M.F., whilst presence of persulphuric acid did not. Dr. Gladstone, in reply, said they also were making experiments without grids, but had not made sufficient progress to discuss them at present. Mr. Hibbert and himself believed the effects of local action inconsiderable, whilst Messrs. Armstrong and Robertson thought them very important. He hoped that ere long the points would be settled conclusively.—A paper on workshop ballistic and other shielded galvanometers, by Prof. W. E. Ayrton, F.R.S., and Mr. T. Mather, was read by Prof. Ayrton. The galvanometers described were of the type having movable coils and fixed magnets, the advantages of which are well known. In designing the ballistic instruments, their aim had been to obtain sensibility and portability, combined with being screened from external influences, for it was often desirable to measure the magnetic fluxes and fields in dynamos by apparatus near the machines. One of the improvements adopted was the narrow coil described in a paper "On the Shape of Movable Coils, &c.," read before the Society in 1890. Such coils are particularly advantageous for ballistic instruments, for not only can greater swings be obtained by the discharge of a given quantity of electricity through such a coil than with ordinary shaped coils when the periodic times are the same, but even when the same control is used, the same length of wire in the coil, and suspended in the same field, the narrow coil is more sensitive to discharges than coils of any other shape. Another improvement was the use of phosphor bronze strip for the suspensions instead of round wire. For a given tensile strength, both the control and the subpermanent set could be diminished by using strip. In February 1888 the authors made a d'Arsonval of the ordinary type as a ballistic instrument, and found that although it was suitable for comparing condensers, yet for induction measurements the damping was excessive unless the resistance in the circuit was very large. This greatly reduced the sensitiveness. In 1890 they tried one of Carpentier's milliamperemeters as a ballistic instrument, but found it insensitive. A narrow coil instrument made in the same year was found to be sensitive for currents; but as the coil was wound on copper to get damping, it was not suitable for ballistic work. In January 1892 a somewhat similar instrument was constructed for ballistic purposes, and was found very sensitive and convenient. Although the coil had only a resistance of 13 ohms, one microcoulomb gave a swing of 170 divisions on a scale 2000 divisions distant, the periodic time being 2·7 seconds. The instrument could be used near electromagnets or dynamos, and was so sensitive that for ordinary induction measurements very large resistances can be put in series with it, thus reducing the damping to a very small amount. On the other hand, the coil could be brought to rest immediately by a short circuit key. It had the further advantage that it was not necessary to redetermine its constant every time it was used. The chief disadvantage of such instruments was the variable damping on closed circuits of different resistances. This could, however, be overcome by arranging shunts and resistances so that the external resistance between the galvanometer terminals was the same for all sensibilities. A portable ballistic instrument, intended for workshop use, was next described. This had a narrow coil and a pointer moving over a dial whose whole circumference was divided into 200 parts. The instrument had been designed to give a complete revolution for a reversal of a flux of two million C.G.S. lines, but the pointer could turn through two or more revolutions. To test strong fields a test coil with a total area of 10,000 square centimetres is used, and has a trigger arrangement for suddenly twisting it through two right angles. The instrument then reads off directly the strength of

field in C.G.S. lines. To vary the sensitiveness in known proportions, resistances are employed. Referring to the improvements made in movable coil instruments since January 1890, when a paper on "Galvanometers" was read before the Society by Dr. Sumpner and the present authors, Prof. Ayrton said Mr. Crompton had greatly increased the sensitiveness of Carpentier's instruments by suspending the coils with phosphor-bronze strip. Mr. Paul had brought out a narrow-coil instrument which combined the advantages of portability, dead-beatness, quickness,



and sensibility. Specimens of these instruments were exhibited. The narrow coils are inclosed in silver tubes, which serve to damp the oscillations. Such a coil is suspended within a brass tube which also forms the mirror chamber, and slides down between the poles of a circular magnet fixed to the base. To clamp the coil, a plug mounted on a slotted spring passes through a hole in the brass tube. A tube can be taken out and replaced by another containing a coil of different resistance in a few seconds. An instrument of this kind, with a coil of 300 ohms, gave 95 divisions per microampere, and the damping on open circuit was such that any swing was $\frac{1}{3}$ of the previous one. On comparing recent instruments with those mentioned in the paper on galvanometers above referred to, a distinct improvement is apparent, for their sensitiveness is, for the same resistance and periodic time, as great as that of Thomson instruments. Prof. Perry remarked that the forces dealt with were extremely small. Mr. Swinburne thought that ballistic galvanometers might be regarded as instruments indicating the time integral of E.M.F. rather than quantity. Illustrating his meaning by reference to dynamos, he said that if two machines arranged as dynamo and motor were joined by wires, then, if the armature of the dynamo were turned through any angle, that of the motor would move through the same angle, supposing friction, &c., eliminated. Speaking of figures of merit, he pointed out that the power consumed was the important factor. Prof. S. P. Thompson inquired what was the longest period yet obtained with narrow-coil instruments. The decay of magnetism in large dynamos was so slow that very long periods were required. He himself had used a weighted coil for such measurements. He also wished to know why the figures of merit were expressed in terms of scale divisions on a scale at 2000 divisions distance, instead of in angular measure or in tangents. Mr. E. W. Smith asked what was the length of strip required to prevent permanent set when the deflection exceeded a revolution. Mr. A. P. Trotter thought that, in testing magnetic fluxes by the workshop ballistic instrument, the test coil might be left in circuit instead of putting in another coil. He wished to know what error was introduced by the change of damping caused by the resistance of the circuit not being quite constant. In his reply, Prof. Ayrton said Mr. Boys had pointed out that the scientific way to lengthen period was not by weighting the coils or needles, but to weaken the control. Periods of 5 seconds had been obtained. At present it was not easy to obtain longer periods owing to difficulties in obtaining sufficiently thin strip, and to the magnetism of materials.

Zoological Society, June 14.—Prof. W. H. Flower, C.B., F.R.S., President, in the chair.—The Secretary read a report on the additions that had been made to the Society's Menagerie during the month of May 1892, calling special attention to a pair of the rare and beautiful Passerine bird the Grey Colly-Shrike (*Hypocolius ampelinus*) from Fao, Persian Gulf, presented by Mr. W. D. Cumming. He also made some remarks on the most interesting objects observed during a recent visit to the Zoological Gardens of Rotterdam, the Hague, Amsterdam, and Antwerp.—A communication from Mr. T. D. A. Cockerell contained particulars of the occurrence of a species

of Jacana (*Jacana spinosa*) in Jamaica.—Dr. John Anderson, F.R.S., exhibited and made remarks on some specimens of the Mole-Rat (*Spalax typhlus*) from Egypt.—Prof. Romanes gave an account of some results recently obtained from the cross-breeding of Rats and of Rabbits, and showed that it did not follow that a blending of the characters of the parents was the result of crossing two different varieties.—Prof. Howes exhibited and made remarks on some photographs received from Prof. Parker, of Otago, New Zealand, illustrative of Sea-Lions, Penguins, and Albatrosses in their native haunts.—Dr. Dawson made remarks on the Fur-Seal of Alaska, and exhibited a series of photographs illustrating the attitudes and mode of life of these animals.—Mr. Sclater called attention to the habits of a South African Snake (*Dasyatis scabra*) as exhibited by an example now in the Society's Gardens.—Mr. Sclater also read some extracts from a letter addressed to him by Mr. H. H. Johnston, C.B., announcing the despatch of a consignment of natural history specimens illustrative of the fauna and flora of the Shire Highlands.—Mr. W. Saville Kent exhibited and made remarks on some photographs of a species of the genus *Podargus*, showing the strange attitudes of these birds in a living state.—Mr. F. E. Beddard read a paper on the brain and muscular anatomy of *Aulacodus*.—Mr. Gerard W. Butler read a paper on the subdivision of the body-cavity in Snakes, being a continuation of the subject treated of in a memoir on the subdivision of the body-cavity in Lizards, Crocodiles, and Birds, previously read before the Society.—Mr. J. W. Gregory gave an account of his researches on the British Palaeogene Bryozoa, of which he recognized thirty species, represented in the National Collection by about 750 specimens.—Mr. Sclater gave an account of a small collection of Birds from Anguilla, West Indies, made by Mr. W. R. Elliott, one of the collectors employed by the Committee for the exploration of the Lesser Antilles.—Prof. G. J. Romanes, F.R.S., read a paper on a seemingly new diagnostic character of the Primates, which was that the terminal joints of both hands and feet in all species of this Order are destitute of hairs. This rule did not apply to the Lemurs.—Mr. O. Thomas read a paper on the genus *Echinops*, of the order Insectivora, and gave notes on the dentition of the allied genera *Ericulus* and *Centetes*.—Mr. G. A. Boulenger gave an account of the Reptiles and Batrachians collected by Mr. C. Hose on Mount Dulit, North Borneo. Amongst these was a fine new Lizard of the genus *Varanus*, proposed to be called *V. heteropholis*. Two new Batrachians were also described as *Rhacophorus dulitensis* and *Nectophryne hosii*.—A paper was read by Lieut.-Colonel H. H. Godwin-Austen, F.R.S., on new species and varieties of the Land-Molluscan genus *Diplommatina*, collected by himself, and more recently by Mr. W. Doherty, in the Naga and Manipur Hill ranges. The author described twenty-seven supposed new species, the most remarkable being *D. unirenata*, with a peculiarly formed peristome.—A communication was read from Mr. B. B. Woodward on the mode of growth and the structure of the shell in *Velates conoideus*, Lamk., and in other *Neritidae*. The mode of growth and the structure of this shell were described as follows: Up to a certain point the growth is normal; a change in the direction of growth afterwards takes place, and the test is enlarged by the addition of fresh shelly matter on the exterior of the under side, and by the removal of previously-formed layers on the inner surface. The internal septum that serves the purpose of a myophore was shown to have originated in the paries, which, in the course of growth, had been replaced by the septum. In this respect *Velates conoideus* epitomized in its life-history conditions which are found in distinct recent species of the closely-allied genus *Neritina*. The relations of the paries and septum in this last genus were also described in this paper.—This meeting closes the present session. The next session (1892-93) will commence in November 1892.

PARIS.

Academy of Sciences, June 20.—M. d'Abbadie in the chair.—Phenomena of the residual life of muscle taken from the living being: physiological action of the muscular bases, by MM. Arm. Gautier and L. Landi.—On the influence of mineral filters on liquids containing substances produced by microbes, by M. Arloing.—On the sanitary system adopted by the Venice Conference to prevent cholera from penetrating into Europe through the Isthmus of Suez, by M. P. Brouardel. Four previous conferences for the reform of the quarantine system having failed, that convened at Venice in January 1892 has at last adopted a system chiefly advocated by the French dele-

gates, and practically tested on the Pyrenees frontier during the cholera in Spain two years ago. On that occasion the passengers' linen was disinfected in heating ovens by steam under pressure, and the cholera patients, real or suspected, were isolated. It having been shown that it is practically impossible for a vessel to pass the Suez Canal in quarantine, without contact with the shores, it was resolved that no vessel should be allowed to pass into the Mediterranean unless it was free from infection or had been completely disinfected. Vessels from the Orient which have had no case of cholera since their departure will be allowed a perfectly free passage. Those which have had cases of cholera during the voyage, but none for seven days before arrival, will be allowed to pass the Canal in quarantine if they have a medical officer and a disinfecting stove on board. If not, they will be retained at the entrance of the Canal, where a sanitary station will be erected, and where the disinfection will take place. Infected vessels will be detained at the entrance, the patients will be disembarked and isolated, and the vessels will be disinfected. It is calculated that, out of 16,000 vessels that have passed through the Canal in five years, under the regulations now adopted 28 would have had to undergo a delay of a few hours for disinfection, and 2 would have been detained for a few days.—On the law of correspondence of tangent planes in the transformation of surfaces by curved symmetry, by M. S. Mangeot.—On the distribution of pressures in a rectangular solid charged transversally, by M. Flamant.—On the law of resistance of the cylinders utilized in the cru-her manometers, by M. P. Vieille.—On the Doppler-Fizeau method, by M. Moessard. If the relative motions of the source and the observer be alone considered, without reference to the distortion of the wave-front due to motion through the connecting medium, the ratio of the real to the apparent wave-length will be $\frac{V}{V - v + v'}$, where V is the velocity of wave propagation, v that of the source, v' that of the observer. The true formula for this ratio is $\frac{V - v'}{V - v}$,

which, in the case of $V = v$, will differ from the former by infinity.—An examination of the possibility of a reciprocal action between an electrified body and a magnet, by M. Vaschy. Showing that such an action cannot exist unless it be due to a physical quality of the ether different from that implied by the coefficients k and k' in the electric and magnetic laws of attraction, viz. $f = k \frac{qq'}{r^2}$, and $f = k' \frac{mm'}{r^2}$.—Action of nitric oxide on

the metallic oxides, by MM. Paul Sabatier and J. B. Senderens.—On a bromo-nitride of phosphorus, by M. A. Besson.—On permolybdic acid, by M. E. Péchard.—On the alteration of preserved ferruginous mineral waters, by M. J. Riban.—On the transformation of gallic acid into pyrogallol: fusion point of pyrogallol, by M. P. Cazeneuve.—On the intestinal calculi of the cachalot (*ambre gris*), by M. Georges Pouchet.—The heliotropism of the *Nauplius*, by M. C. Viguié.—Researches on the proximate composition of vegetable tissues, by M. G. Bertrand.—On the action of some mineral salts on lactic fermentation, by M. Ch. Richet.—On the respiratory exchange, by MM. Chr. Bohr and V. Henriquez. An account of experiments showing that the lungs are not only the seat of the process of gaseous exchange, but also of the oxidation of tissue elements.—Origins and trophic centres of the vaso-dilatatory nerves, by M. J. P. Morat.—Researches on the requirements of the vine, by M. A. Muntz.—On the topography of some lakes of the Jura, the Bugy, and the Isère, by M. A. Delebecque.

AMSTERDAM.

Royal Academy of Sciences, May 28.—Prof. van de Sande Bakhuyzen in the chair.—Mr. Behrens dealt with specimens of brass made by compression of the constituents at ordinary temperature by Prof. W. Spring, Liège, Belgium. One of the specimens, kindly forwarded by Prof. Spring, was of a reddish colour, and had been produced by compressing a mixture of 9 parts of copper and 1 part of zinc; another, pale yellow, by compressing a mixture of 7 parts Cu and 3 parts Zn. Both specimens had been filed up twice, and again consolidated by pressure. The reddish metal was a little softer than common cast brass; it could be somewhat flattened under the hammer. The yellow metal was harder than common brass, and brittle. Both varieties contain a great quantity of yellow alloy, which seems to be in an amorphous state, showing a uniform, finely granular appearance, without any vestige of the beautiful crystallites, so characteristic for copper-zinc alloys, obtained by

fusion. Further, a good deal of angular fragments of red copper, some of them cracked and doubled up, with yellow threads between the red lumps and strands, and finally some zinc, angular fragments and threads, trending outwards and uniting near the curved surface of the cylindrical specimens. The metal is nearly, but not wholly compact. There is much that gives evidence of a flow in the yellow alloy and in the zinc, but nothing pointing to a truly liquid state of the alloy or one of its components. Regelation seems to be put aside, while there does not remain any doubt that zinc and copper have been intimately mixed and actually united by repeated filing and compression. One may venture to say, that a more complete union of metallic powders by compression will lead to alloys of most remarkable properties, and may give some alloys that cannot be produced by fusion.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

BOOKS.—Our Earth—Night to Twilight, vol. i.: G. Ferguson (Unwin).—The Alternate Current Transformer, vol. ii. The Utilization of Induced Currents: Prof. J. A. Fleming (*Electrician* Company).—Essai sur la Vie et la Mort: A. Sabatier (Paris, Babé).—Chambers's Encyclopedia, vol. ix. (Chambers).—Iconographia Floræ Japonicæ, vol. i. Part 2: Dr. K. Yatabe (Tokyo).—Thermodynamique à l'Usage des Ingénieurs: A. Witz (Paris, Gauthier-Villars).—U.S. Relief Map (Washington).—Bees for Pleasure and Profit: G. G. Samson (Lockwood).—Waterdale Researches; or, Fresh Light on the Dynamic Action and Ponderosity of Matter: 'Waterdale' (Chapman and Hall).—Helen Keller: Souvenir of the First Summer Meeting of the American Association to Promote the Teaching of Speech to the Deaf; second edition (Washington, Volta Bureau).

PAMPHLETS.—Descriptive List of the Fishes of Lorain County, Ohio: L. M. McCormick (Oberlin).—Land Improvement in India: Colonel A. T. Fraser (Bombay, Thacker).—Proposal for a National Photographic Record and Survey: W. J. Harrison (Harrison).

SERIALS.—Journal of the College of Science, Imperial University, Japan, vol. vi, Part 1 (Tokyo).—Journal of the Institution of Electrical Engineers, June (Spon).—Journal of the Polynesian Society, vol. i. No. 1 (Wellington, N.Z.).—Proceedings of the Society for Psychological Research, June (Kegan Paul).—Deutsche Ueberseesische Meteorologische Beobachtungen, Heft 4 (Hamburg).—Journal and Proceedings of the Royal Society of New South Wales, vol. xxv, 1891 (Kegan Paul).—Beiträge zur Biologie der Pflanzen, v. Band, 3 Heft (Williams and Norgate).—Bulletin from the Laboratories of Natural History of the State University of Iowa, vol. ii. No. 2 (Iowa).—Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie, Sechzehnter Band, 1 Heft, Fünfzehnter Band, 3 Heft (Williams and Norgate).—Encyclopædia der Naturwissenschaften, Erste Abthg., 67 Liefg., Zweite Abthg., 69-70 Lief. (Williams and Norgate).

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